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(71)出願人　000005843
松下電子工業株式会社
大阪府高槻市幸町１番１号

(72)発明者　田村　啓
大阪府高槻市幸町１番１号　松下電子工業株式会社内

(72)発明者　石田　裕之
大阪府高槻市幸町１番１号　松下電子工業株式会社内

(72)発明者　清水　裕一
大阪府高槻市幸町１番１号　松下電子工業株式会社内

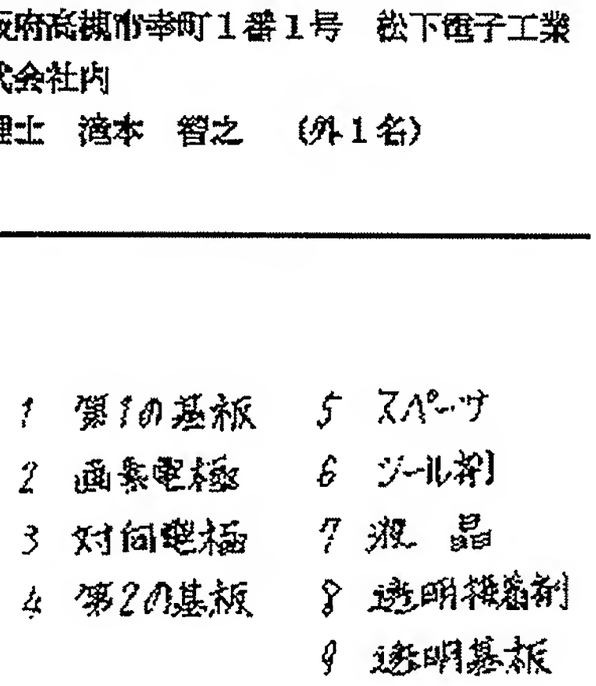
(74)代理人　弁理士　滝本　智之　（外１名）

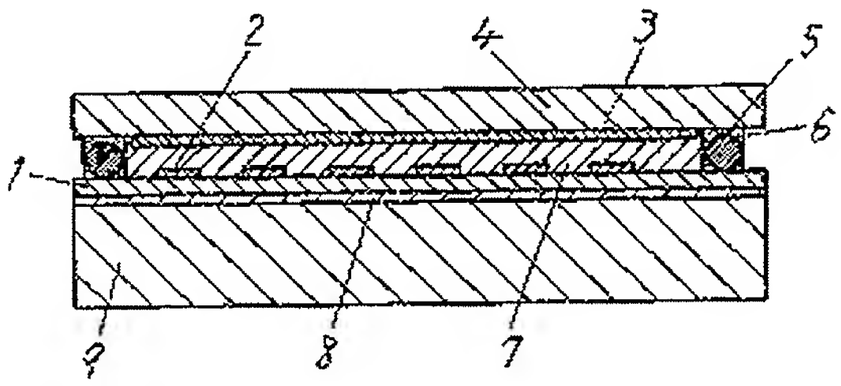
(54)【発明の名称】　液晶パネルおよびその製造方法

(57)【要約】

【課題】　パネルギャップの均一性を高め、良好な表示の均一性を得る。

【解決手段】　複数の画素電極２を有する第１の基板の裏面全体に透明接着剤８を塗布し、この第１の基板１の裏面全体に透明基板９を透明接着剤８にて接着する。ここで、第１の基板１、接着剤８および透明基板９は互いに反射しないように屈折率がほぼ同じものを用いる。第１の基板１と、複数の画素電極２と対向する対向電極３およびカラーフィルターを有する第２の基板４とを所定の間隔を設けて相対向させ、両基板の外周部にシール剤６で両基板を貼り合わせ、第１の基板１と第２の基板４との間に液晶７を封入する。





【特許請求の範囲】

【請求項１】　複数の画素電極を有する第１の基板と、前記複数の画素電極と対向する対向電極を有する第２の基板とを所定の間隔を設けて相対向させ、前記第１の基板と前記第２の基板との間に液晶を封入した液晶パネルであって、少なくとも前記第１の基板の裏面に、この第１の基板の屈折率とほぼ同じ屈折率を有する透明基板を備えたことを特徴とする液晶パネル。

【請求項２】　請求項１記載の液晶パネルにおいて、前記透明基板がホウケイ酸ガラスまたはアクリル樹脂からなることを特徴とする液晶パネル。

【請求項３】　請求項１または請求項２記載の液晶パネルにおいて、前記透明基板は、この透明基板が備えられた基板と対向する基板と熱膨張係数がほぼ同じであることを特徴とする液晶パネル。

【請求項４】　複数の画素電極を有する第１の基板の裏面全体にこの第１の基板と屈折率がほぼ同じである接着剤を塗布し、前記第１の基板の裏面上に前記第１の基板と屈折率がほぼ同じである透明基板を前記接着剤にて接着し、前記第１の基板と前記複数の画素電極と対向する対向電極を有する第２の基板とを所定の間隔を設けて相対向させ、前記第１の基板と前記第２の基板との間に液晶を封入することを特徴とする液晶パネルの製造方法。

【請求項５】　複数の画素電極を有する第１の基板の裏面全体にこの第１の基板と屈折率がほぼ同じである両面粘着シートを備え、前記第１の基板の裏面上にこの第１の基板と屈折率がほぼ同じである透明基板を前記両面粘着シートにて接着したことを特徴とする請求項４記載の液晶パネルの製造方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、液晶パネルおよびその製造方法に関するものである。

【０００２】

【従来の技術】一般に、液晶パネルには、良好な表示を得るため、対向する２枚の基板間隔（以下パネルギャップという）の均一性が求められる。

【０００３】まず、従来の液晶パネルの構成について図４を用いて説明する。図４（ａ）は従来の液晶パネルの概略断面図、図４（ｂ）はその概略平面図を示したものである。図４（ａ）に示すように、第１の基板１上にＴＦＴ等の画素電極２を形成し、対向電極３およびカラーフィルター（図示せず）等を備えた第２の基板４と第１の基板１とを所定の距離を設けて相対向させ、両基板の外周部をスペーサビーズ球５を有するシール剤６により貼り合わせる。第１の基板１と第２の基板４との間に液晶７を注入口（図示せず）により注入し、注入口を閉塞することにより、液晶パネルを完成させる。

【０００４】

【発明が解決しようとする課題】ところで、近年、液晶パネルにおいては、画素電極２としてポリシリコンＴＦＴ素子を用いているため、第１の基板１として例えば石英基板等の高価な基板が使用されており、コストを削減する必要性から、石英基板の厚みを薄くする傾向にあった。しかし、表示面積は広くするニーズが高まっている。

【０００５】そこで、上記液晶パネルにおいて、第１の基板１を薄くし、かつ表示面積を広くすると、第１の基板１が反ったり、変形をおこしたりするため、両基板の貼り合わせ時のパネルギャップを均一にすることが難しくなるという問題があった。また、両基板の熱膨張係数がそれぞれ異なる場合、完成した液晶パネルを室温で設置する時にはパネルギャップが均一であっても、高温または低温の中に液晶パネルを設置すると、基板が変化し、パネルギャップの均一性が失われるという問題があった。

【０００６】本発明は上記課題を解決するためになされたものであり、パネルギャップの均一性を高め、良好な表示の均一性を得ることのできる表示パネルおよびその製造方法を提供することを目的とする。

【０００７】

【課題を解決するための手段】本発明の請求項１に記載の発明は、複数の画素電極を有する第１の基板と、前記複数の画素電極と対向する対向電極を有する第２の基板とを所定の間隔を設けて相対向させ、前記第１の基板と前記第２の基板との間に液晶を封入した液晶パネルであって、少なくとも前記第１の基板の裏面に、この第１の基板の屈折率とほぼ同じ屈折率を有する透明基板を備えたものである。この構成によれば、基板が反ったり、局所的な基板の変形を抑制することができ、パネルギャップの均一性を高くすることができる。

【０００８】本発明の請求項３に記載の発明は、請求項１または請求項２記載の液晶パネルにおいて、前記透明基板は、この透明基板が備えられた基板と対向する基板と熱膨張係数がほぼ同じであることを特徴とするものである。この構成によれば、液晶パネルの製造工程中に熱が加わったり、もしくは液晶パネルの完成後に熱が加わったりしても、高いパネルギャップの均一性を維持することができる。

【０００９】本発明の請求項４に記載の発明は、複数の画素電極を有する第１の基板の裏面全体にこの第１の基板と屈折率がほぼ同じである接着剤を塗布し、前記第１の基板の裏面上に前記第１の基板と屈折率がほぼ同じである透明基板を前記接着剤にて接着し、前記第１の基板と前記複数の画素電極と対向する対向電極を有する第２の基板とを所定の間隔を設けて相対向させ、前記第１の基板と前記第２の基板との間に液晶を封入したものである。この製造方法によれば、第１の基板上に画素電極を形成する時に、第１の基板の裏面に剛性の高い材質の透明基板を備えているので、第１の基板の反りを小さくす

ることができる。また、両基板の貼り合わせ時に、剛板を使用して両基板を加圧した際、第１の基板に透明基板が備えられているので、異物等による第１の基板の局所的変形を抑制することができ、また、気体で両基板を加圧した際、風圧による第１の基板の反りを抑制することができる。

【００１０】

【発明の実施の形態】以下、本発明の実施の形態について、図面を用いて説明する。

【００１１】図１は、本発明の実施の形態の液晶パネルの概略断面図である。図１において、従来と同じ構成を示すものについては同じ番号を付している。

【００１２】図１において、厚さ０．６ｍｍの石英ガラス基板からなる第１の基板１上には、複数の画素電極２、例えば高温ポリシリコンＴＦＴが設けられている。第１の基板１の裏面全体にアクリル系接着剤等の透明接着剤８を塗布し、厚さ０．５ｍｍ～１０ｍｍ程度のホウケイ酸ガラス基板からなる透明基板９を第１の基板１の裏面全体に透明接着剤８にて接着する。ここで、第１の基板１、接着剤８および透明基板９は互いに反射しないように屈折率がほぼ同じものを用いる。第１の基板１としての石英ガラス基板の屈折率は１．４６であり、そのため、透明接着剤８および透明基板９の屈折率は１．４６±１のものを用いるのが望ましい。第１の基板１と、複数の画素電極２と対向する対向電極３およびカラーフィルター（図示せず）を有する第２の基板４、例えば厚さ１．１ｍｍのホウケイ酸ガラス基板とを所定の間隔を設けて相対向させ、両基板の外周部にスペーサビーズ球５を混入したシール剤６で両基板を貼り合わせ、第１の基板１と第２の基板４との間に液晶７を封入する。

【００１３】ここで、第１の基板１としてはフィルム基板を使用することもできるし、また透明基板９としては、剛性が高く、重量の軽い材質の透明な樹脂基板、例えばアクリル樹脂基板等を用いても良く、安価な基板を用いることができる。また、透明接着剤８としては、アクリル系接着剤以外に、エポキシ樹脂系接着剤、シリコーン系接着剤等を用いることができる。また、接着剤以外に両面粘着シート等を用いても良い。

【００１４】図２（ａ）～（ｃ）は、本発明の液晶パネルの製造方法における工程図を示している。

【００１５】図２（ａ）に示すように、第１の基板１上にＴＦＴ素子等の画素電極２を形成する。その後、図２（ｂ）に示すように、第１の基板１の裏面全体に透明接着剤８を塗布し、この第１の基板１の裏面全体に剛性の高い材質の透明基板９を透明接着剤８にて接着する。ここで、第１の基板１、透明接着剤８および透明基板９には互いに反射しないように屈折率がほぼ同じものを用いる。

【００１６】ここで、パネルギャップの均一性を確保するために、第１の基板１の反りを小さくする必要がある。しかし、第１の基板１上に画素電極２を形成する時に発生する応力のため、一般に画素電極２の形成後、第１の基板１の反りは増大する。例えば、０．６ｍｍの厚みで１２５ｍｍ²の石英ガラス基板上に画素電極２として、高温ポリシリコンＴＦＴを形成した際、透明基板９を備えていない場合には、画素電極２を形成した後、第１の基板１の反りが、１２μｍ～２２μｍ程度、一般的に１７μｍ前後反るのに対し、透明基板９を備えた場合には、２μｍ前後、すなわち１μｍから３μｍ程度に反りを抑えることができる。

【００１７】次に図２（ｃ）に示すように、透明基板９を接着した第１の基板１と、対向電極３およびカラーフィルター（図示せず）等を備えた第２の基板４とを所定の間隔を設けて相対向させ、第１の基板１または第２の基板４の外周部に配置されたスペーサビーズ球５を有するシール剤６で両基板を貼り合わせる。その後、液晶７を液晶注入口（図示せず）により注入し、注入口を閉塞することで液晶パネルを完成させる。または、第１の基板１または第２の基板４の外周部にシール剤６を配置した後、シール剤６を配置した基板に液晶７を滴下し、その後第１の基板１および第２の基板４を貼り合わせて液晶パネルを完成させる。

【００１８】ここで、第１の基板１と第２の基板４とを貼り合わせる時に、通常両基板を、剛板で押圧したり、または気体で圧力をかけたりすることで貼り合わせるが、そのとき約１ｋｇ／ｃｍ²程度の加圧が必要になる。透明基板９を備えていない従来の液晶パネルの製造工程において、剛板を使用して両基板の加圧をする際に、剛板と第１の基板１との間に異物が侵入した場合、加圧による変形が異物よりも基板の方が容易であると、パネルギャップが局所的に変化し、パネルギャップの均一性が大きく損なわれる。基板の変形の容易さ、すなわちヤング弾性率は、一般に基板の厚さの２乗に比例する。

【００１９】本発明によれば、第１の基板１に剛性の高い材質の透明基板９を備えているので、前述の異物によるギャップの局所的な変化を抑制することができる。また、気体で加圧を行う時、貼り合わせ時に基板に圧力による応力がかかるが、第１の基板１に透明基板９が備えられているので、第１の基板１が反ることなく、第１の基板１と第２の基板４との間に均一なパネルギャップを得ることができる。

【００２０】なお、透明基板９を備えた第１の基板１と第２の基板４とをシール剤６で接着硬化する時に、加熱の必要がある場合は、パネルギャップの均一性を確保するために、第２の基板４および透明基板９の熱膨張係数が同一のものが望ましい。

【００２１】また、透明基板９を備えた第１の基板１と第２の基板４とが熱膨張係数の異なる材料である場合は、シール剤６を接着硬化する時に加熱の必要がない場

合は．接着強度の高い紫外線硬化型アクリル系接着剤を使用するのが望ましい。

【００２２】高温ポリシリコンＴＦＴ方式の液晶パネルを製造する場合．画素電極２を形成する際、約１０００℃の熱処理工程を有するため、第１の基板１として石英ガラスを使用する必要がある。一方．第２の基板４は、３００℃以上の熱処理工程を有しないため、一般的に比較的安価なホウケイ酸ガラスを用いることができる。石英ガラスおよびホウケイ酸ガラスの熱膨張係数は．各々５．３×１０$^{-7}$／Ｋおよび４６×１０$^{-7}$／Ｋである。したがって、貼り合わせ後の液晶パネルは、熱による２枚のガラス基板の伸縮量が約８倍異なる。さらに．完成した液晶パネルを高温または低温の中に設置すると．両基板の伸縮量が異なってくる。しかも．両基板の外周部のみをシール剤６で接着しているため．両基板は不均一に変化し、その結果パネルギャップの均一性が損なわれる。

【００２３】しかし、本発明によれば．第２の基板４の熱膨張係数が同一である透明基板９を第１の基板１の裏面に設けているので、この熱変化による第１の基板１および第２の基板４の伸縮量の違いを緩和し、パネルギャップの変化を抑制することができる。

【００２４】なお、上記実施の形態においては．第１の基板１に透明基板９を設けた場合について説明したが、第２の基板４または第１の基板１および第２の基板４の両方の基板に透明基板９を接着しても．上記と同様の効果を得ることができる。

【００２５】また、上記実施の形態においては．ＴＦＴ型液晶パネルについて説明したが、単純マトリクス型液晶パネル、ＭＩＭ型液晶パネル等においても実施できることは言うまでもない。

【００２６】図３は、本発明の液晶パネルの画像をスクリーン上に投射した場合の光学系の概略図である。液晶パネルの表示画像は、プロジェクションレンズ１０を通してスクリーン１１上で焦点を結ぶ。本発明の液晶パネルにおける透明基板９の表面に異物１２が付着した場合．第１の基板１と透明基板９の厚み分、スクリーン１１とずれた位置に異物１２の焦点を結ぶため、画質上の点状しみとして認識される。異物１２の焦点位置とスクリーン１１の位置のずれが大きくなるほど、点状しみは．大きくなると同時にコントラストが低下し．認識しにくくなる。対角１．３インチの液晶パネルを４０インチに投射する場合、第１の基板１と透明基板９の厚さの合計が５ｍｍ以上では、１ｍｍ以下の異物１２による点状しみは、スクリーン上で認識されなかった。

【００２７】なお、透明基板９の接着面と反対の面に無反射コーティングを施しておくことにより、液晶パネルの透過率の向上および表面での反射光による画素電極２の誤動作を防ぐ効果を持たせることができる。

【００２８】

【発明の効果】以上のように本発明の液晶パネルによれば．複数の画素電極を有する第１の基板と、前記複数の画素電極と対向する対向電極を有する第２の基板とを所定の間隔を設けて相対向させ、前記第１の基板と前記第２の基板の間に液晶を封入した液晶表示パネルであって．少なくとも第１の基板の裏面に．この第１の基板の屈折率とほぼ同じ屈折率を有する透明基板を備えたものであるから、基板の反りおよび局所的変形が抑制され、パネルギャップの均一性を高くすることができ．良好な表示品質を得ることができる。

【００２９】また、本発明の液晶パネルの製造方法によれば．第１の基板上に画素電極を形成する時に．第１の基板の裏面に剛性の高い材質の透明基板を備えているので．第１の基板の反りを小さくすることができ．パネルギャップの均一性を確保することができる。また．両基板の貼り合わせ時に、剛板を使用して両基板を加圧した際．第１の基板に透明基板が備えられているので．異物等による第１の基板の局所的変形を抑制することができ．また、気体で両基板を加圧した際．風圧による第１の基板の反りを抑制することができる。

【図面の簡単な説明】

【図１】本発明の一実施の形態における液晶パネルの断面図

【図２】本発明の一実施の形態における液晶パネルの工程図

【図３】本発明の液晶パネルによって投射した時の光学系の概略図

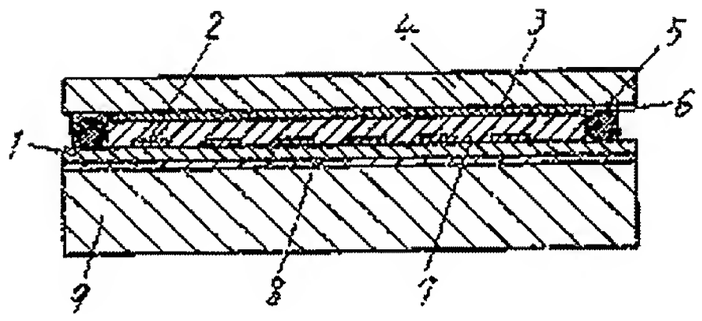
【図４】（ａ）従来の液晶パネルの断面図
（ｂ）同平面図

【符号の説明】

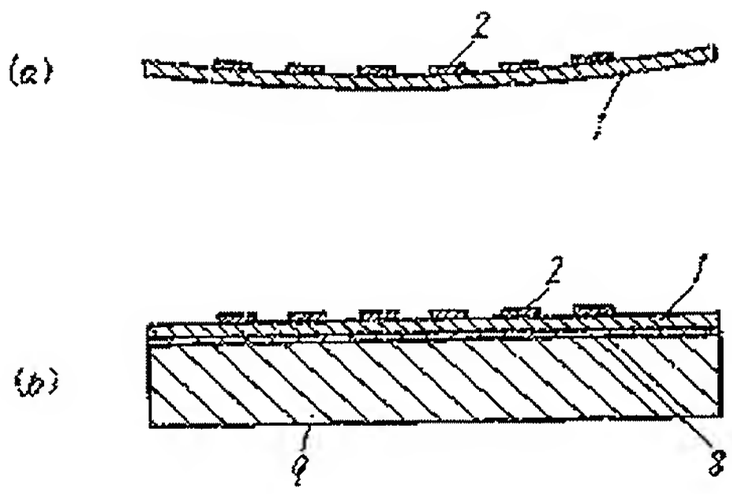
１　第１の基板
２　画素電極
３　対向電極
４　第２の基板
７　液晶
８　透明接着剤
９　透明基板

【図1】

1 第1の基板
2 画素電極
3 対向電極
4 第2の基板
5 スペーサ
6 シール剤
7 液 晶
8 透明絶縁膜
9 透明基板

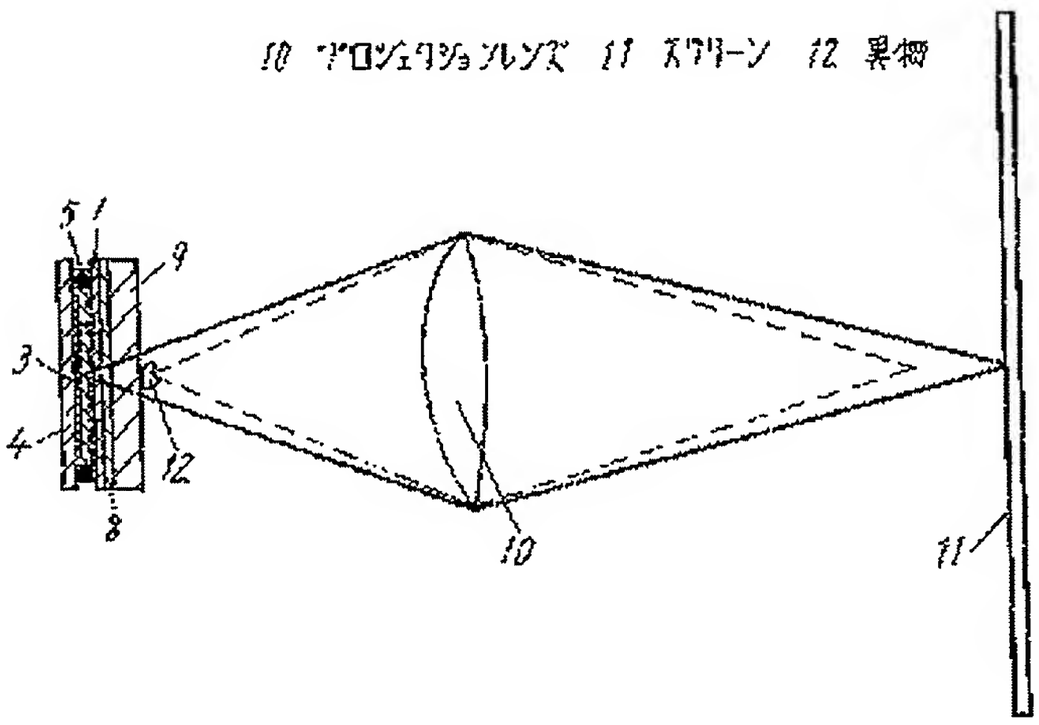


【図2】

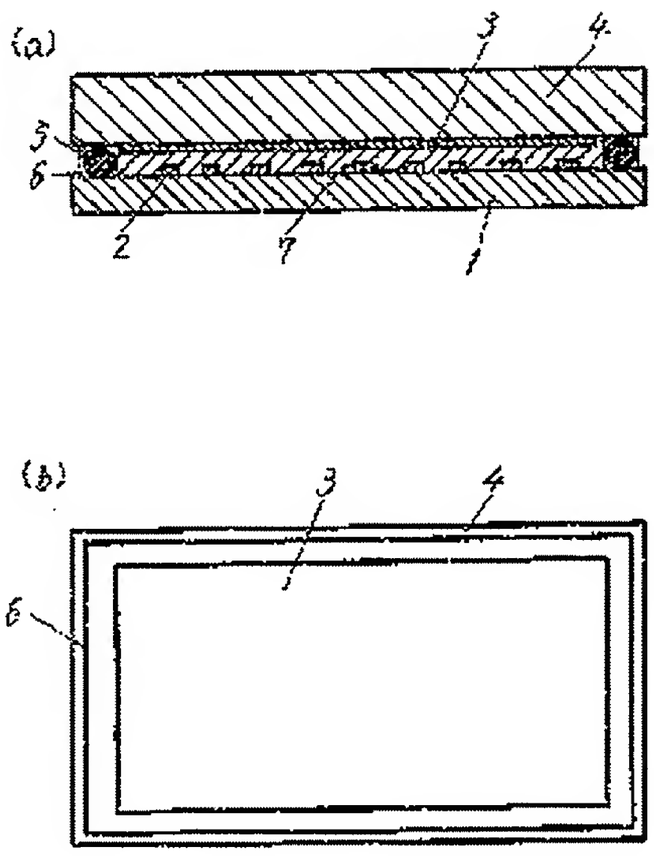


【図3】

10 プロジェクションレンズ 11 スクリーン 12 異物



【図4】



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CLAIMS

[Claim(s)]
[Claim 1] Prepare predetermined spacing and phase opposite of the 1st substrate which has two or more pixel electrodes, and the 2nd substrate which has said two or more pixel electrodes and the counterelectrode which counters is carried out. The liquid crystal panel characterized by having the transparence substrate which is the liquid crystal panel which enclosed liquid crystal between said 1st substrate and said 2nd substrate, and has the almost same refractive index as the refractive index of this 1st substrate at the rear face of said 1st substrate at least.
[Claim 2] The liquid crystal panel characterized by said transparence substrate consisting of borosilicate glass or acrylic resin in a liquid crystal panel according to claim 1.
[Claim 3] Said transparence substrate is a liquid crystal panel characterized by the substrate with which it had this transparence substrate in the liquid crystal panel according to claim 1 or 2, the substrate which counters, and a coefficient of thermal expansion being almost the same.
[Claim 4] This the 1st substrate and refractive index apply the almost same adhesives to the whole rear face of the 1st substrate which has two or more pixel electrodes. Said 1st substrate and the transparence substrate with the almost same refractive index are pasted up with said adhesives on the rear face of said 1st substrate. The manufacture approach of the liquid crystal panel which prepares predetermined spacing, is made to carry out phase opposite of the 2nd substrate which has said 1st substrate and said two or more pixel electrodes, and the counterelectrode which counters, and is characterized by enclosing liquid crystal between said 1st substrate and said 2nd substrate.
[Claim 5] The manufacture approach of the liquid crystal panel according to claim 4 characterized by having equipped with the double-sided pressure sensitive adhesive sheet with this the 1st almost same substrate and refractive index the whole rear face of the 1st substrate which has two or more pixel electrodes, and pasting up this 1st substrate and the transparence substrate with the almost same refractive index with said double-sided pressure sensitive adhesive sheet on the rear face of said 1st substrate.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a liquid crystal panel and its manufacture approach.
[0002]
[Description of the Prior Art] Generally, a liquid crystal panel is asked for the homogeneity of two substrates spacing (henceforth a panel gap) which counters in order to obtain a good display.
[0003] First, the configuration of the conventional liquid crystal panel is explained using drawing 4 R> 4. Drawing 4 (a) shows the outline sectional view of the conventional liquid crystal panel, and drawing 4 (b) shows the outline top view. As shown in drawing 4 (a), the pixel electrodes 2, such as TFT, are formed on the 1st substrate 1, a predetermined distance is established, phase opposite of the 2nd substrate 4 and 1st substrate 1 equipped with the counterelectrode 3, the color filter (not shown), etc. is carried out, and the periphery section of both substrates is stuck by the sealing compound 6 which has the spacer bead ball 5. Liquid crystal 7 is poured in by the inlet (not shown) between the 1st substrate 1 and the 2nd substrate 4, and a liquid crystal panel is completed by blockading an inlet.
[0004]
[Problem(s) to be Solved by the Invention] By the way, since the poly-Si TFT component was used as a pixel electrode 2 in the liquid crystal panel, the substrate for example, with a quartz substrate expensive as the 1st substrate 1 etc. is used, and the inclination which makes thickness of a quartz substrate thin was suited from the need of reducing cost in recent years. However, the needs which make a screen product large are increasing.
[0005] Then, in the above-mentioned liquid crystal panel, if the 1st substrate 1 is made thin and a screen product is made large, in order for the 1st substrate 1 to curve or to cause deformation, there was a problem that it became difficult to make the panel gap at the time of the lamination of both substrates into homogeneity. Moreover, when the coefficients of thermal expansion of both substrates differed, respectively and the liquid crystal panel was installed into an elevated temperature or low temperature even if the panel gap was uniform, when installing the completed liquid crystal panel at a room temperature, the substrate changed and there was a problem that the homogeneity of a panel gap was lost.
[0006] It is made in order that this invention may solve the above-mentioned technical problem, and the homogeneity of a panel gap is raised, and it aims at offering the display panel which can acquire the homogeneity of a good display, and its manufacture approach.
[0007]
[Means for Solving the Problem] The 1st substrate with which invention of this invention according to claim 1 has two or more pixel electrodes, Prepare predetermined spacing and phase opposite of the 2nd substrate which has said two or more pixel electrodes and the counterelectrode which counters is carried out. It is the liquid crystal panel which enclosed liquid crystal between said 1st substrate and said 2nd substrate, and has the transparence substrate which has the almost same refractive index as the refractive index of this 1st substrate at the rear face of said 1st substrate at least. According to this configuration, a substrate can curve, or deformation of a local substrate can be controlled, and homogeneity of a panel gap can be made high.
[0008] Invention of this invention according to claim 3 is characterized by said transparence substrate having almost the same substrate with which it had this transparence substrate, substrate which counters, and coefficient of thermal expansion in a liquid crystal panel according to claim 1 or 2. According to this configuration, even if heat is added into the production process of a liquid crystal panel or heat is added after completion of a liquid crystal panel, the homogeneity of a high panel gap is maintainable.

[0009] Invention of this invention according to claim 4 applies the adhesives with this the 1st almost same substrate and refractive index to the whole rear face of the 1st substrate which has two or more pixel electrodes. Said 1st substrate and the transparence substrate with the almost same refractive index are pasted up with said adhesives on the rear face of said 1st substrate. Predetermined spacing is prepared, phase opposite of the 2nd substrate which has said 1st substrate and said two or more pixel electrodes, and the counterelectrode which counters is carried out, and liquid crystal is enclosed between said 1st substrate and said 2nd substrate. Since according to this manufacture approach the rear face of the 1st substrate is equipped with the transparence substrate of the rigid high quality of the material when forming a pixel electrode on the 1st substrate, the curvature of the 1st substrate can be made small. Moreover, since the 1st substrate is equipped with the transparence substrate when both substrates are pressurized using a rigid plate at the time of the lamination of both substrates, when local deformation of the 1st substrate by a foreign matter etc. can be controlled and both substrates are pressurized with a gas, the curvature of the 1st substrate by the wind pressure can be controlled.
[0010]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained using a drawing.

[0011] Drawing 1 is the outline sectional view of the liquid crystal panel of the gestalt of operation of this invention. In drawing 1 , the same number is attached about what shows the same configuration as the former.
[0012] In drawing 1 , it is prepared on the 1st substrate 1 which consists of a quartz-glass substrate with a thickness of 0.6mm, two or more pixel electrodes 2, for example, elevated-temperature poly-Si TFT. The transparence adhesives 8, such as acrylic adhesives, are applied to the whole rear face of the 1st substrate 1, and the transparence substrate 9 which consists of a borosilicate glass substrate with a thickness of 0.5mm - about 10mm is pasted up on the whole rear face of the 1st substrate 1 with the transparence adhesives 8. Here, the 1st substrate 1, adhesives 8, and transparence substrate 9 use what has an almost the same refractive index so that it may not reflect mutually. The refractive index of the quartz-glass substrate as the 1st substrate 1 is 1.46, therefore, as for the refractive index of the transparence adhesives 8 and the transparence substrate 9, it is desirable to use the thing of 1.46**1. Prepare predetermined spacing and phase opposite of the 1st substrate 1, and the 2nd substrate 4 which has two or more pixel electrodes 2, the counterelectrode 3 which counters, and a color filter (not shown), for example, borosilicate glass substrate with a thickness of 1.1mm, is carried out. Liquid crystal 7 is enclosed for both substrates between lamination, the 1st substrate 1, and the 2nd substrate 4 by the sealing compound 6 which mixed the spacer bead ball 5 in the periphery section of both substrates.
[0013] Here, a film substrate can also be used as the 1st substrate 1, and as a transparence substrate 9, rigidity can be high, you may use, the transparent resin substrate, for example, the acrylic resin substrate etc., of the quality of the material with light weight etc., and a cheap substrate can be used. Moreover, as transparence adhesives 8, epoxy resin adhesive, silicone system adhesives, etc. can be used in addition to acrylic adhesives. Moreover, a double-sided pressure sensitive adhesive sheet etc. may be used in addition to adhesives.
[0014] Drawing 2 (a) - (c) shows process drawing in the manufacture approach of the liquid crystal panel of this invention.
[0015] As shown in drawing 2 (a), the pixel electrodes 2, such as a TFT component, are formed on the 1st substrate 1. Then, as shown in drawing 2 (b), the transparence adhesives 8 are applied to the whole rear face of the 1st substrate 1, and the transparence substrate 9 of the rigid high quality of the material is pasted up on the whole rear face of this 1st substrate 1 with the transparence adhesives 8. Here, what has an almost the same refractive index is used for the 1st substrate 1, transparence adhesives 8, and transparence substrate 9 so that it may not reflect mutually.
[0016] Here, in order to secure the homogeneity of a panel gap, it is necessary to make the curvature of the 1st substrate 1 small. However, generally the curvature of the 1st substrate 1 increases after formation of the pixel electrode 2 for the stress generated when forming the pixel electrode 2 on the 1st substrate 1. for example, when elevated-temperature poly-Si TFT is formed as a pixel electrode 2 on the quartz-glass substrate of 2 125mm and it does not have the transparence substrate 9 by the thickness of 0.6mm When the curvature of the 1st substrate 1 is equipped with 12 micrometers - about 22 micrometers of transparence substrates 9 to generally curving around 17 micrometers after forming the pixel electrode 2, curvature can be suppressed from 1 micrometer to about 3 micrometers around 2 micrometers.
[0017] Next, as shown in drawing 2 (c), predetermined spacing is prepared, phase opposite of the 1st substrate 1 on which the transparence substrate 9 was pasted up, and the 2nd substrate 4 equipped with the counterelectrode

3, the color filter (not shown), etc. is carried out, and both substrates are stuck by the sealing compound 6 which has the spacer bead ball 5 arranged at the periphery section of the 1st substrate 1 or the 2nd substrate 4. Then, liquid crystal 7 is poured in by the liquid crystal inlet (not shown), and a liquid crystal panel is completed by blockading an inlet. Or liquid crystal 7 is dropped at the substrate which has arranged the sealing compound 6 after having arranged the sealing compound 6 in the periphery section of the 1st substrate 1 or the 2nd substrate 4, the 1st substrate 1 and 2nd substrate 4 are stuck after that, and a liquid crystal panel is completed.

[0018] Here, although it sticks by pressing both substrates with a rigid plate, or usually applying a wind pressure with a gas when sticking the 1st substrate 1 and 2nd substrate 4, about 1kg/cm2 pressurization is then needed. In the production process of the conventional liquid crystal panel which is not equipped with the transparence substrate 9, when pressurizing both substrates using a rigid plate and a foreign matter invades between a rigid plate and the 1st substrate 1, a panel gap changes [deformation by pressurization] locally that the substrate is easier than a foreign matter, and the homogeneity of a panel gap is spoiled greatly. Generally it is proportional to the square of the thickness of a substrate, the ease, i.e., the young elastic modulus, of deformation of a substrate.

[0019] According to this invention, since the 1st substrate 1 is equipped with the transparence substrate 9 of the rigid high quality of the material, a local change of the gap by the above-mentioned foreign matter can be controlled. Moreover, a uniform panel gap can be obtained between the 1st substrate 1 and the 2nd substrate 4, without the 1st substrate 1 curving, since the 1st substrate 1 is equipped with the transparence substrate 9 although the stress by the wind pressure is applied to a substrate at the time of lamination when pressurizing with a gas.

[0020] In addition, in order to secure the homogeneity of a panel gap when carrying out adhesion hardening of the 1st substrate 1 and 2nd substrate 4 equipped with the transparence substrate 9 by the sealing compound 6, and there is the need for heating, what has the same coefficient of thermal expansion of the 2nd substrate 4 and the transparence substrate 9 is desirable.

[0021] Moreover, when the 1st substrate 1 equipped with the transparence substrate 9 and the 2nd substrate 4 are the ingredients with which coefficients of thermal expansion differ, adhesion hardening of the sealing compound 6 is carried out and there is no need for heating, it is desirable to use ultraviolet curing mold acrylic adhesives with high bond strength.

[0022] Since it has about 1000-degree C heat treatment process in case the pixel electrode 2 is formed when manufacturing the liquid crystal panel of an elevated-temperature poly-Si TFT method, it is necessary to use quartz glass as the 1st substrate 1. On the other hand, since the 2nd substrate 4 does not have a heat treatment process 300 degrees C or more, general comparatively cheap borosilicate glass can be used for it. The coefficients of thermal expansion of quartz glass and borosilicate glass are 5.3x10-7/K, and 46x10-7/K respectively. Therefore, the amounts of telescopic motion of two glass substrates according [the liquid crystal panel after lamination] to heat differ about 8 times. Furthermore, if the completed liquid crystal panel is installed into an elevated temperature or low temperature, the amounts of telescopic motion of both substrates differ. And since only the periphery section of both substrates is pasted up by the sealing compound 6, both substrates change to an ununiformity and, as a result, the homogeneity of a panel gap is spoiled.

[0023] However, according to this invention, since the transparence substrate 9 with the same coefficient of thermal expansion of the 2nd substrate 4 is formed in the rear face of the 1st substrate 1, the difference in the amount of telescopic motion of the 1st substrate 1 by this thermal change and the 2nd substrate 4 can be eased, and change of a panel gap can be controlled.

[0024] In addition, in the gestalt of the above-mentioned implementation, although the case where the transparence substrate 9 was formed in the 1st substrate 1 was explained, even if it pastes up the transparence substrate 9 on the substrate of both the 2nd substrate 4 or the 1st substrate 1, and the 2nd substrate 4, the same effectiveness as the above can be acquired.

[0025] Moreover, in the gestalt of the above-mentioned implementation, although the TFT mold liquid crystal panel was explained, it cannot be overemphasized that it can carry out also in a simple matrix liquid crystal panel, an MIM mold liquid crystal panel, etc.

[0026] Drawing 3 is the schematic diagram of the optical system at the time of projecting the image of the liquid crystal panel of this invention on a screen. The display image of a liquid crystal panel connects a focus on a screen 11 through the projection lens 10. When a foreign matter 12 adheres to the front face of the transparence substrate 9 in the liquid crystal panel of this invention, the focus of a foreign matter 12 is

recognized as a punctiform stain on eye a join pig and image quality in the location which shifted from a part for the thickness of the 1st substrate 1 and the transparence substrate 9, and the screen 11. While becoming large, contrast falls and it is hard coming to recognize a punctiform stain, so that a gap of the focal location of a foreign matter 12 and the location of a screen 11 becomes large. When the liquid crystal panel of 1.3 inches of vertical angles is projected on 40 inches, the punctiform stain according [the sum total of the thickness of the 1st substrate 1 and the transparence substrate 9] to the foreign matter 12 1mm or less at 5mm or more has not been recognized on a screen.

[0027] In addition, the effectiveness which prevents the improvement in the permeability of a liquid crystal panel and malfunction of the pixel electrode 2 by the reflected light in a front face can be given by performing nonreflective coating to the field opposite to the adhesion side of the transparence substrate 9.

[0028]

[Effect of the Invention] The 1st substrate which has two or more pixel electrodes as mentioned above according to the liquid crystal panel of this invention, Prepare predetermined spacing and phase opposite of the 2nd substrate which has said two or more pixel electrodes and the counterelectrode which counters is carried out. It is the liquid crystal display panel which enclosed liquid crystal between said 1st substrate and said 2nd substrate. Since the rear face of the 1st substrate is equipped with the transparence substrate which has the almost same refractive index as the refractive index of this 1st substrate at least, the curvature of a substrate and local deformation can be controlled, homogeneity of a panel gap can be made high, and good display quality can be acquired.

[0029] Moreover, since according to the manufacture approach of the liquid crystal panel of this invention the rear face of the 1st substrate is equipped with the transparence substrate of the rigid high quality of the material when forming a pixel electrode on the 1st substrate, the curvature of the 1st substrate can be made small and the homogeneity of a panel gap can be secured. Moreover, since the 1st substrate is equipped with the transparence substrate when both substrates are pressurized using a rigid plate at the time of the lamination of both substrates, when local deformation of the 1st substrate by a foreign matter etc. can be controlled and both substrates are pressurized with a gas, the curvature of the 1st substrate by the wind pressure can be controlled.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to a liquid crystal panel and its manufacture approach.

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PRIOR ART

[Description of the Prior Art] Generally, a liquid crystal panel is asked for the homogeneity of two substrates spacing (henceforth a panel gap) which counters in order to obtain a good display.
[0003] First, the configuration of the conventional liquid crystal panel is explained using drawing 4 R> 4. Drawing 4 (a) shows the outline sectional view of the conventional liquid crystal panel, and drawing 4 (b) shows the outline top view. As shown in drawing 4 (a), the pixel electrodes 2, such as TFT, are formed on the 1st substrate 1, a predetermined distance is established, phase opposite of the 2nd substrate 4 and 1st substrate 1 equipped with the counterelectrode 3, the color filter (not shown), etc. is carried out, and the periphery section of both substrates is stuck by the sealing compound 6 which has the spacer bead ball 5. Liquid crystal 7 is poured in by the inlet (not shown) between the 1st substrate 1 and the 2nd substrate 4, and a liquid crystal panel is completed by blockading an inlet.

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EFFECT OF THE INVENTION

[Effect of the Invention] The 1st substrate which has two or more pixel electrodes as mentioned above according to the liquid crystal panel of this invention, Prepare predetermined spacing and phase opposite of the 2nd substrate which has said two or more pixel electrodes and the counterelectrode which counters is carried out. It is the liquid crystal display panel which enclosed liquid crystal between said 1st substrate and said 2nd substrate. Since the rear face of the 1st substrate is equipped with the transparence substrate which has the almost same refractive index as the refractive index of this 1st substrate at least, the curvature of a substrate and local deformation can be controlled, homogeneity of a panel gap can be made high, and good display quality can be acquired.

[0029] Moreover, since according to the manufacture approach of the liquid crystal panel of this invention the rear face of the 1st substrate is equipped with the transparence substrate of the rigid high quality of the material when forming a pixel electrode on the 1st substrate, the curvature of the 1st substrate can be made small and the homogeneity of a panel gap can be secured. Moreover, since the 1st substrate is equipped with the transparence substrate when both substrates are pressurized using a rigid plate at the time of the lamination of both substrates, when local deformation of the 1st substrate by a foreign matter etc. can be controlled and both substrates are pressurized with a gas, the curvature of the 1st substrate by the wind pressure can be controlled.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, since the poly-Si TFT component was used as a pixel electrode 2 in the liquid crystal panel, the substrate for example, with a quartz substrate expensive as the 1st substrate 1 etc. is used, and the inclination which makes thickness of a quartz substrate thin was suited from the need of reducing cost in recent years. However, the needs which make a screen product large are increasing.
[0005] Then, in the above-mentioned liquid crystal panel, if the 1st substrate 1 is made thin and a screen product is made large, in order for the 1st substrate 1 to curve or to cause deformation, there was a problem that it became difficult to make the panel gap at the time of the lamination of both substrates into homogeneity. Moreover, when the coefficients of thermal expansion of both substrates differed, respectively and the liquid crystal panel was installed into an elevated temperature or low temperature even if the panel gap was uniform, when installing the completed liquid crystal panel at a room temperature, the substrate changed and there was a problem that the homogeneity of a panel gap was lost.
[0006] It is made in order that this invention may solve the above-mentioned technical problem, and the homogeneity of a panel gap is raised, and it aims at offering the display panel which can acquire the homogeneity of a good display, and its manufacture approach.

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MEANS

[Means for Solving the Problem] The 1st substrate with which invention of this invention according to claim 1 has two or more pixel electrodes, Prepare predetermined spacing and phase opposite of the 2nd substrate which has said two or more pixel electrodes and the counterelectrode which counters is carried out. It is the liquid crystal panel which enclosed liquid crystal between said 1st substrate and said 2nd substrate, and has the transparence substrate which has the almost same refractive index as the refractive index of this 1st substrate at the rear face of said 1st substrate at least. According to this configuration, a substrate can curve, or deformation of a local substrate can be controlled, and homogeneity of a panel gap can be made high.
[0008] Invention of this invention according to claim 3 is characterized by said transparence substrate having almost the same substrate with which it had this transparence substrate, substrate which counters, and coefficient of thermal expansion in a liquid crystal panel according to claim 1 or 2. According to this configuration, even if heat is added into the production process of a liquid crystal panel or heat is added after completion of a liquid crystal panel, the homogeneity of a high panel gap is maintainable.
[0009] Invention of this invention according to claim 4 applies the adhesives with this the 1st almost same substrate and refractive index to the whole rear face of the 1st substrate which has two or more pixel electrodes. Said 1st substrate and the transparence substrate with the almost same refractive index are pasted up with said adhesives on the rear face of said 1st substrate. Predetermined spacing is prepared, phase opposite of the 2nd substrate which has said 1st substrate and said two or more pixel electrodes, and the counterelectrode which counters is carried out, and liquid crystal is enclosed between said 1st substrate and said 2nd substrate. Since according to this manufacture approach the rear face of the 1st substrate is equipped with the transparence substrate of the rigid high quality of the material when forming a pixel electrode on the 1st substrate, the curvature of the 1st substrate can be made small. Moreover, since the 1st substrate is equipped with the transparence substrate when both substrates are pressurized using a rigid plate at the time of the lamination of both substrates, when local deformation of the 1st substrate by a foreign matter etc. can be controlled and both substrates are pressurized with a gas, the curvature of the 1st substrate by the wind pressure can be controlled.
[0010]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained using a drawing.

[0011] Drawing 1 is the outline sectional view of the liquid crystal panel of the gestalt of operation of this invention. In drawing 1 , the same number is attached about what shows the same configuration as the former.
[0012] In drawing 1 , it is prepared on the 1st substrate 1 which consists of a quartz-glass substrate with a thickness of 0.6mm, two or more pixel electrodes 2, for example, elevated-temperature poly-Si TFT. The transparence adhesives 8, such as acrylic adhesives, are applied to the whole rear face of the 1st substrate 1, and the transparence substrate 9 which consists of a borosilicate glass substrate with a thickness of 0.5mm - about 10mm is pasted up on the whole rear face of the 1st substrate 1 with the transparence adhesives 8. Here, the 1st substrate 1, adhesives 8, and transparence substrate 9 use what has an almost the same refractive index so that it may not reflect mutually. The refractive index of the quartz-glass substrate as the 1st substrate 1 is 1.46, therefore, as for the refractive index of the transparence adhesives 8 and the transparence substrate 9, it is desirable to use the thing of 1.46**1. Prepare predetermined spacing and phase opposite of the 1st substrate 1, and the 2nd substrate 4 which has two or more pixel electrodes 2, the counterelectrode 3 which counters, and a color filter (not shown), for example, borosilicate glass substrate with a thickness of 1.1mm, is carried out. Liquid crystal 7 is enclosed for both substrates between lamination, the 1st substrate 1, and the 2nd substrate 4 by the sealing compound 6 which mixed the spacer bead ball 5 in the periphery section of both substrates.

[0013] Here, a film substrate can also be used as the 1st substrate 1, and as a transparence substrate 9, rigidity can be high, you may use, the transparent resin substrate, for example, the acrylic resin substrate etc., of the quality of the material with light weight etc., and a cheap substrate can be used. Moreover, as transparence adhesives 8, epoxy resin adhesive, silicone system adhesives, etc. can be used in addition to acrylic adhesives. Moreover, a double-sided pressure sensitive adhesive sheet etc. may be used in addition to adhesives.
[0014] Drawing 2 (a) - (c) shows process drawing in the manufacture approach of the liquid crystal panel of this invention.
[0015] As shown in drawing 2 (a), the pixel electrodes 2, such as a TFT component, are formed on the 1st substrate 1. Then, as shown in drawing 2 (b), the transparence adhesives 8 are applied to the whole rear face of the 1st substrate 1, and the transparence substrate 9 of the rigid high quality of the material is pasted up on the whole rear face of this 1st substrate 1 with the transparence adhesives 8. Here, what has an almost the same refractive index is used for the 1st substrate 1, transparence adhesives 8, and transparence substrate 9 so that it may not reflect mutually.
[0016] Here, in order to secure the homogeneity of a panel gap, it is necessary to make the curvature of the 1st substrate 1 small. However, generally the curvature of the 1st substrate 1 increases after formation of the pixel electrode 2 for the stress generated when forming the pixel electrode 2 on the 1st substrate 1. for example, when elevated-temperature poly-Si TFT is formed as a pixel electrode 2 on the quartz-glass substrate of 2 125mm and it does not have the transparence substrate 9 by the thickness of 0.6mm When the curvature of the 1st substrate 1 is equipped with 12 micrometers - about 22 micrometers of transparence substrates 9 to generally curving around 17 micrometers after forming the pixel electrode 2, curvature can be suppressed from 1 micrometer to about 3 micrometers around 2 micrometers.
[0017] Next, as shown in drawing 2 (c), predetermined spacing is prepared, phase opposite of the 1st substrate 1 on which the transparence substrate 9 was pasted up, and the 2nd substrate 4 equipped with the counterelectrode 3, the color filter (not shown), etc. is carried out, and both substrates are stuck by the sealing compound 6 which has the spacer bead ball 5 arranged at the periphery section of the 1st substrate 1 or the 2nd substrate 4. Then, liquid crystal 7 is poured in by the liquid crystal inlet (not shown), and a liquid crystal panel is completed by blockading an inlet. Or liquid crystal 7 is dropped at the substrate which has arranged the sealing compound 6 after having arranged the sealing compound 6 in the periphery section of the 1st substrate 1 or the 2nd substrate 4, the 1st substrate 1 and 2nd substrate 4 are stuck after that, and a liquid crystal panel is completed.
[0018] Here, although it sticks by pressing both substrates with a rigid plate, or usually applying a wind pressure with a gas when sticking the 1st substrate 1 and 2nd substrate 4, about 1kg/cm2 pressurization is then needed. In the production process of the conventional liquid crystal panel which is not equipped with the transparence substrate 9, when pressurizing both substrates using a rigid plate and a foreign matter invades between a rigid plate and the 1st substrate 1, a panel gap changes [deformation by pressurization] locally that the substrate is easier than a foreign matter, and the homogeneity of a panel gap is spoiled greatly. Generally it is proportional to the square of the thickness of a substrate, the ease, i.e., the young elastic modulus, of deformation of a substrate.
[0019] According to this invention, since the 1st substrate 1 is equipped with the transparence substrate 9 of the rigid high quality of the material, a local change of the gap by the above-mentioned foreign matter can be controlled. Moreover, a uniform panel gap can be obtained between the 1st substrate 1 and the 2nd substrate 4, without the 1st substrate 1 curving, since the 1st substrate 1 is equipped with the transparence substrate 9 although the stress by the wind pressure is applied to a substrate at the time of lamination when pressurizing with a gas.
[0020] In addition, in order to secure the homogeneity of a panel gap when carrying out adhesion hardening of the 1st substrate 1 and 2nd substrate 4 equipped with the transparence substrate 9 by the sealing compound 6, and there is the need for heating, what has the same coefficient of thermal expansion of the 2nd substrate 4 and the transparence substrate 9 is desirable.
[0021] Moreover, when the 1st substrate 1 equipped with the transparence substrate 9 and the 2nd substrate 4 are the ingredients with which coefficients of thermal expansion differ, adhesion hardening of the sealing compound 6 is carried out and there is no need for heating, it is desirable to use ultraviolet curing mold acrylic adhesives with high bond strength.
[0022] Since it has about 1000-degree C heat treatment process in case the pixel electrode 2 is formed when manufacturing the liquid crystal panel of an elevated-temperature poly-Si TFT method, it is necessary to use

quartz glass as the 1st substrate 1. On the other hand, since the 2nd substrate 4 does not have a heat treatment process 300 degrees C or more, general comparatively cheap borosilicate glass can be used for it. The coefficients of thermal expansion of quartz glass and borosilicate glass are 5.3x10-7/K, and 46x10-7/K respectively. Therefore, the amounts of telescopic motion of two glass substrates according [the liquid crystal panel after lamination] to heat differ about 8 times. Furthermore, if the completed liquid crystal panel is installed into an elevated temperature or low temperature, the amounts of telescopic motion of both substrates differ. And since only the periphery section of both substrates is pasted up by the sealing compound 6, both substrates change to an ununiformity and, as a result, the homogeneity of a panel gap is spoiled.

[0023] However, according to this invention, since the transparence substrate 9 with the same coefficient of thermal expansion of the 2nd substrate 4 is formed in the rear face of the 1st substrate 1, the difference in the amount of telescopic motion of the 1st substrate 1 by this thermal change and the 2nd substrate 4 can be eased, and change of a panel gap can be controlled.

[0024] In addition, in the gestalt of the above-mentioned implementation, although the case where the transparence substrate 9 was formed in the 1st substrate 1 was explained, even if it pastes up the transparence substrate 9 on the substrate of both the 2nd substrate 4 or the 1st substrate 1, and the 2nd substrate 4, the same effectiveness as the above can be acquired.

[0025] Moreover, in the gestalt of the above-mentioned implementation, although the TFT mold liquid crystal panel was explained, it cannot be overemphasized that it can carry out also in a simple matrix liquid crystal panel, an MIM mold liquid crystal panel, etc.

[0026] Drawing 3 is the schematic diagram of the optical system at the time of projecting the image of the liquid crystal panel of this invention on a screen. The display image of a liquid crystal panel connects a focus on a screen 11 through the projection lens 10. When a foreign matter 12 adheres to the front face of the transparence substrate 9 in the liquid crystal panel of this invention, the focus of a foreign matter 12 is recognized as a punctiform stain on eye a join pig and image quality in the location which shifted from a part for the thickness of the 1st substrate 1 and the transparence substrate 9, and the screen 11. While becoming large, contrast falls and it is hard coming to recognize a punctiform stain, so that a gap of the focal location of a foreign matter 12 and the location of a screen 11 becomes large. When the liquid crystal panel of 1.3 inches of vertical angles is projected on 40 inches, the punctiform stain according [the sum total of the thickness of the 1st substrate 1 and the transparence substrate 9] to the foreign matter 12 1mm or less at 5mm or more has not been recognized on a screen.

[0027] In addition, the effectiveness which prevents the improvement in the permeability of a liquid crystal panel and malfunction of the pixel electrode 2 by the reflected light in a front face can be given by performing nonreflective coating to the field opposite to the adhesion side of the transparence substrate 9.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional view of the liquid crystal panel in the gestalt of 1 operation of this invention
[Drawing 2] Process drawing of the liquid crystal panel in the gestalt of 1 operation of this invention
[Drawing 3] The schematic diagram of the optical system when projecting with the liquid crystal panel of this invention
[Drawing 4] (a) The sectional view of the conventional liquid crystal panel
(b) This top view
[Description of Notations]
1 1st Substrate
2 Pixel Electrode
3 Counterelectrode
4 2nd Substrate
7 Liquid Crystal
8 Transparence Adhesives
9 Transparence Substrate

[Translation done.]

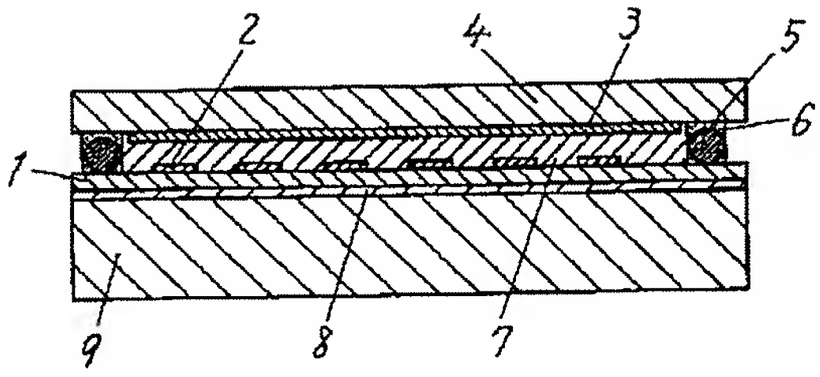
* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

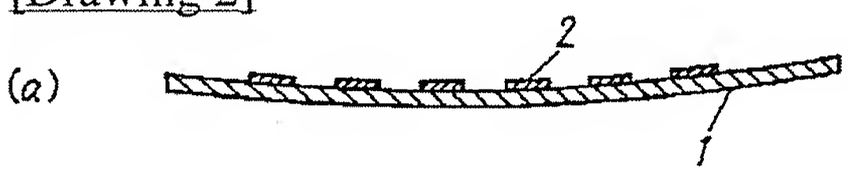
DRAWINGS

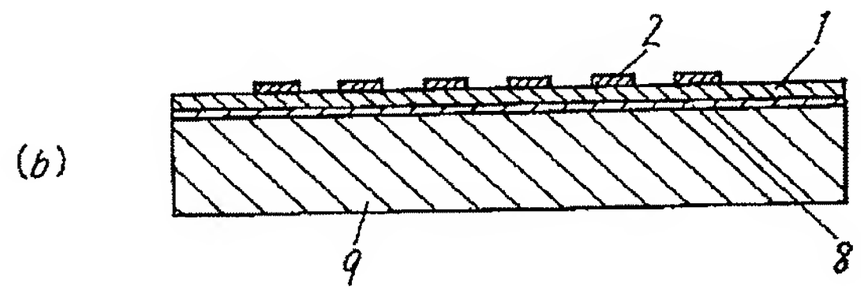
[Drawing 1]

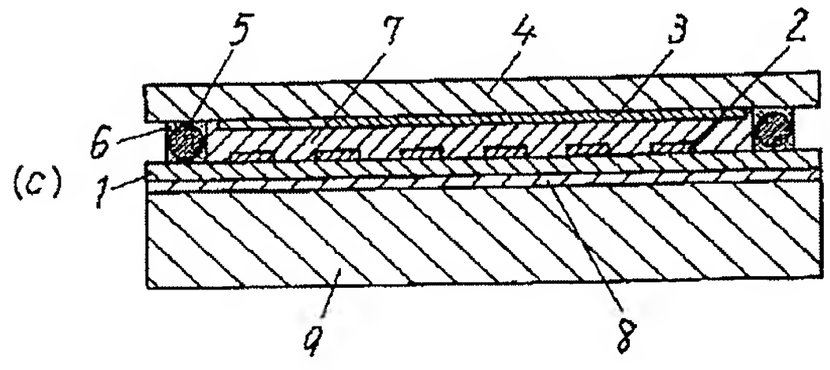
1 第1の基板　5 スペーサ
2 画素電極　6 シール剤
3 対向電極　7 液 晶
4 第2の基板　8 透明接着剤
9 透明基板



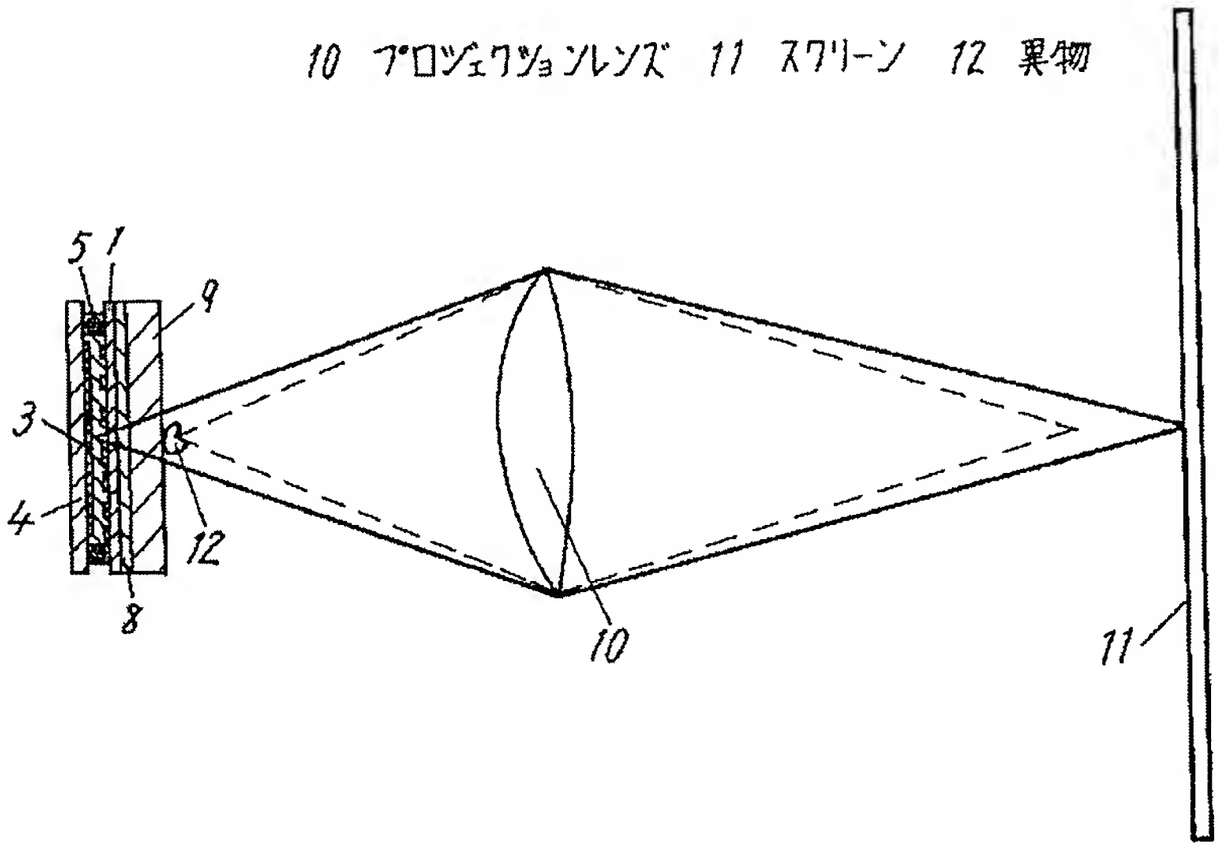
[Drawing 2]



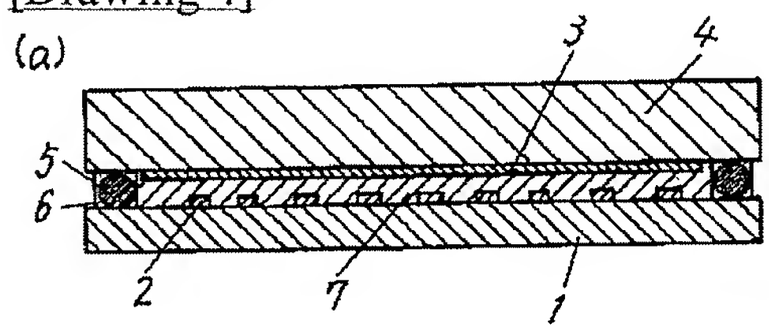


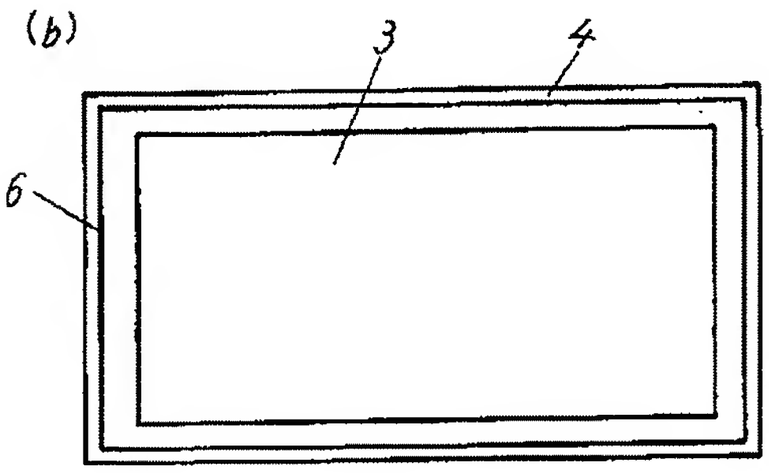


[Drawing 3]



[Drawing 4]





[Translation done.]